Intensive Care Med
https://doi.org/10.1007/s00134-025-07920-2

WHAT'S NEW IN INTENSIVE CARE

Ten tips for managing caustic ingestion in adult patients

Thaïs Walter[1,2*], Sophie Gosselin[3,4,5] and Benjamin Deniau[2,6,7]

© 2025 Springer-Verlag GmbH Germany, part of Springer Nature

Caustic or corrosive ingestion in adult patient is a rare but potentially life-threatening condition with a mortality of 10% among intensive care unit (ICU) patients [1, 2]. This narrative review outlines ten essential tips for managing patients with caustic ingestion.

(1) Intubate early and look for signs of hollow organ perforation

The priority is to exclude upper airway obstruction. A change in voice, appearance of inspiratory dyspnea or stridor and a uvula edema should prompt emergency intubation [3]. During laryngoscopy, vocal cord lesions and signs of aspiration should be assessed. In cases of airway obstruction, a short course of corticosteroids may be considered, based on a rationale similar to that used for laryngeal edema in the prevention of extubation failure [4]. Signs of hollow organ perforation (thoracic emphysema and abdominal guarding) should prompt immediate transfer to a surgical center.

(2) Do not use activated charcoal, insert nasogastric tube, provoke vomiting or make patient drink

There is no specific antidote for caustic ingestion. Activated charcoal, milk, or water have never been proven to reduce injury severity and may increase the risk of vomiting, worsening esophageal injury. Similarly, insertion of a nasogastric tube offers no proven benefit and may increase perforation risk in grade III esophageal injury.

*Correspondence: thais.walter10@gmail.com
[1] Université Paris Cité, INSERM U942 MASCOT, Paris, France
Full author information is available at the end of the article

(3) Determine the composition of the product

Severe caustic ingestion is caused by strong acid (pH < 2) and strong alkalis (pH > 12) [5, 6]. In ICU patients, the most common agents are sodium hydroxide (49%), hydrochloric acid (20%), sodium hypochlorite (9%), ammonia (4%), and sulfuric acid 3% [6]. Voluntary ingestion (90% of adult cases) and higher concentrations are associated with worse outcomes [1]. The Poison Center should be contacted if the nature of the product is unknown.

(4) Carefully check for co-intoxication

Co-intoxication are present in approximately 14% of ICU caustic ingestion cases. It should be suspected in patients with early hemodynamic instability within hours of ingestion or altered state of consciousness. The former case should raise suspicion of co-intoxication with a cardiotropic drug, and prompt consideration for a transfer to an extracorporeal membrane oxygenation center.

(5) Call a referral center to discuss orientation and management

In case of ingestion of pure hydrochloric acid, ammonia or sulfuric acid (regardless of volume), ingestion of > 200 mL of strong alkali such as lye, or a hemodynamic instability, transfer to an ICU is warranted. The center should have access to major abdominal surgery and the capability for a thoracic approach [6]. Referral to ICU expert centers should be favored as it is associated with improved early survival [1].

(6) Correct any systemic effect of the caustic substance

Only symptomatic treatments are available for the systemic effects of caustic ingestion [7]. Limited data exist regarding the efficacy of sodium bicarbonate for

SHOUT
SHARE
IT

systemic acidemia, proton pump inhibitors, antibiotic prophylaxis outside surgical context and corticosteroids [5] but proton pump inhibitors are commonly used [8]. Our expert opinion is to not use antibiotic prophylaxis outside surgical context, even in severe cases, and to use proton pump inhibitor orally or IV, whichever way is available. Corticosteroids have been shown to reduce stricture formation in pediatric patients with grade 2b endoscopic esophageal injuries [9]. Their use is now recommended in this population [10] but no data exist for the adult population.

(7) Avoid endoscopy-based strategies for early caustic ingestion assessment

Endoscopy is inadequate for accurately assessing the depth of intramural necrosis in caustic injuries. Among 14 patients who underwent emergency esophagectomy based on grade 3b injuries identified via endoscopy, only 50% demonstrated full-thickness esophageal necrosis upon pathological examination [11]. Endoscopy-based management is associated with a 50% increase in emergency esophagectomies compared with a computed tomography (CT)-based management [11].

Patients managed conservatively despite grade 3b findings on endoscopy, but without full-thickness necrosis on CT evaluation, experienced no mortality and no need for rescue esophagectomy during the acute phase [12]. On the long term, CT-guided management is associated with decreased rate of repeat suicide, increased rate of self-sufficiency in eating and breathing, and lower healthcare costs [11, 12]. In addition, CT scans are readily available 24/7 [13]. Therefore, surgical decision-making should transition from endoscopy-based grading to CT scan evaluation. Endoscopic evaluation should be reserved for proven nonionic contrast agent allergy, and the initial assessment of children, a population which is beyond the scope of this review.

(8) Perform a CT scan 6 h post-ingestion to guide surgical decisions

The CT scan should encompass the neck (up to the upper surface of the palate), thorax, and abdomen. It should be performed with and without intravenous administration of a nonionic contrast agent. Non-contrast images are essential as they serve as a baseline for comparison with contrast-enhanced images.

Gastric injuries are classified according to a three-stage grading which are unrelated to Zargar's endoscopic grading [7, 14] (Fig. 1). Grade 1 injuries show normal appearing organs. Grade 2 injuries show wall edema, with increased post-contrast wall enhancement, and grade 3 injuries show a transmural necrosis with no post-contrast wall enhancement.

Esophageal injuries are classified according to a four-stage grading (Fig. 1) [14]. Grade 1 injuries show homogenous enhancement of the esophageal wall; grade 2a injuries display internal enhancement of the esophageal mucosa and hypodense aspect of the esophageal wall while concomitant enhancement of the outer esophageal wall may sometimes confer a "target" aspect; grade 2b injuries present as a fine rim of external wall enhancement; grade 3 injuries show the absence of post-contrast wall enhancement. A CT-based grade 3 injury of the stomach or the esophagus requires surgical resection of the affected organ, other grades require close monitoring. The insertion of a jejunostomy during the surgery should be fostered.

Due to the rarity of caustic injuries, CT grading can be challenging, and the fear of missing full-thickness esophageal necrosis may lead physicians to rely on an endoscopy-based strategy. However, re-reading by an expert center is reliable [12] and can help avoid futile esophagectomy [11], offering a clearly favorable benefit–risk balance. A similar benefit–risk analysis applies to contrast-induced acute kidney injury, which very existence remains a subject of debate [15]. In case of hemodynamic instability or signs of hollow organ perforation, patients should be transferred straight to the operating room.

(9) Bronchoscopy is mandatory before surgical treatment

This will detect tracheobronchial necrosis resulting from mediastinal extension of esophageal necrosis or from aspiration of the caustic substance [14]. In such cases, pulmonary patch repair through a right thoracotomy approach is required to avoid tracheal perforation [14, 16].

(10) In the absence of surgical treatment, start rehabilitation early

In the absence of surgical intervention, oral feeding should be reintroduced as soon as patients swallow normally. Psychiatric evaluation is mandatory in all patients with voluntary administration, prior to hospital discharge. Long-term follow-up should be performed in a specialized center to monitor risks of stricture formation and esophageal and gastric metaplasia.

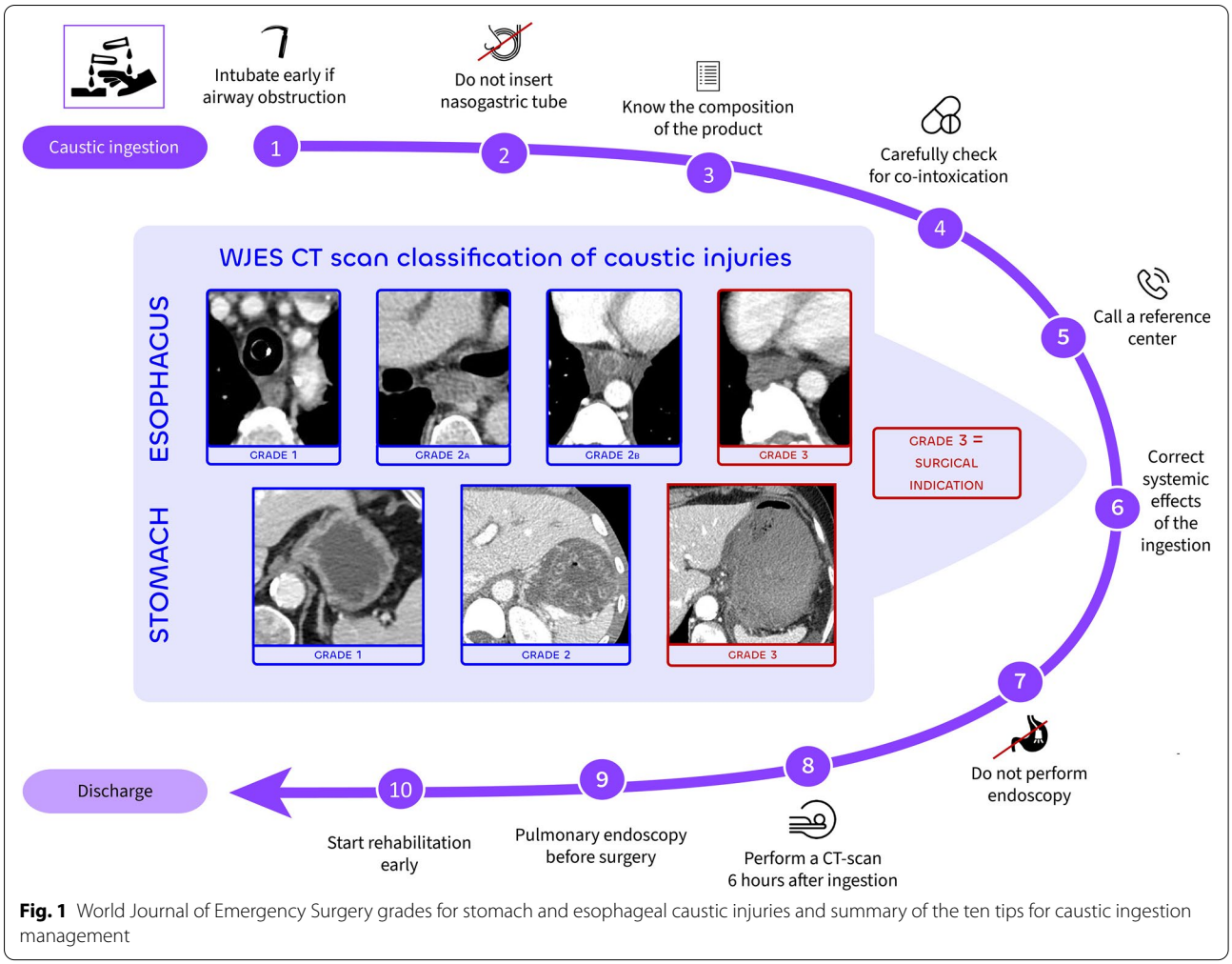

Fig. 1 World Journal of Emergency Surgery grades for stomach and esophageal caustic injuries and summary of the ten tips for caustic ingestion management

Author details
[1] Université Paris Cité, INSERM U942 MASCOT, Paris, France. [2] Department of Anesthesia and Critical Care, APHP, Hôpital Saint-Louis, Paris, France. [3] Département de Médecine d'urgence, Centre Intégré de Santé Et de Services Sociaux de La Montérégie-Centre-Hôpital Charles-Lemoyne, Greenfield Park, Canada. [4] Département de Médecine Familiale Et de Médecine d'urgence, Université de Sherbrooke, Sherbrooke, Canada. [5] Centre Antipoison du, Québec, Canada. [6] Université Paris Cité, INSERM UMR 970, PARCC, Paris Institute for Transplantation and Organ Regeneration, Paris, France. [7] INI CRCT Network, Nancy, France.

Author contributions
All authors contributed to writing, editing, and design. All authors read and approved the submitted version.

Funding
The authors did not receive financial support for the research, authorship, and/or publication of this article.

Data availability
Not applicable.

Declarations

Conflicts of interest
The authors declare that the article content was written without any commercial or financial relationships that could be perceived as a potential conflict of interest.

Ethical approval
Not applicable.

Consent for publication
Not applicable.

Publisher's Note
Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Received: 11 March 2025 Accepted: 18 April 2025
Published online: 02 June 2025

References

1. Challine A, Maggiori L, Katsahian S, Corté H, Goere D, Lazzati A et al (2022) Outcomes associated with caustic ingestion among adults in a national prospective database in France. JAMA Surg 157(2):112
2. Deniau B, Boulet N, Pétrier M, Mezzarobba M, Coutrot M, Cattan P et al (2024) Epidemiologic features and outcomes associated with caustic ingestion among adults admitted in intensive care unit from 2013 to 2019: a French national observational study. Eur J Trauma Emerg Surg 50(3):905–912
3. Struck MF, Beilicke A, Hoffmeister A, Gockel I, Gries A, Wrigge H et al (2016) Acute emergency care and airway management of caustic ingestion in adults: single center observational study. Scand J Trauma Resusc Emerg Med 24(1):45
4. Quintard H, l'Her E, Pottecher J, Adnet F, Constantin JM, Dejong A et al (2018) Intubation et extubation du patient de réanimation. Anesthésie & Réanimation 4(6):523–547
5. Hoffman RS, Burns MM, Gosselin S (2020) Ingestion of caustic substances. N Engl J Med 382(18):1739–1748
6. Sabzé A, Coutrot M, Dudoignon E, Corte H, Plaud B, Dépret F et al (2024) Hydrochloric acid ingestion in adults: presentation and outcomes in a 10-year retrospective cohort study. Br J Anaesth 133(6):1344–1346
7. Chirica M, Bonavina L, Kelly MD, Sarfati E, Cattan P (2017) Caustic ingestion. Lancet 389(10083):2041–2052
8. Niedzielski A, Schwartz SG, Partycka-Pietrzyk K, Mielnik-Niedzielska G (2020) Caustic agents ingestion in children: a 51-year retrospective cohort study. Ear Nose Throat J 99(1):52–57
9. Usta M, Erkan T, Cokugras FC, Urganci N, Onal Z, Gulcan M et al (2014) High doses of methylprednisolone in the management of caustic esophageal burns. Pediatrics 133(6):e1518–e1524
10. Thomson M, Tringali A, Dumonceau J, Tavares M, Tabbers MM, Furlano R et al (2017) Paediatric gastrointestinal endoscopy: European Society for Paediatric Gastroenterology Hepatology and Nutrition and European Society of Gastrointestinal Endoscopy Guidelines. J pediatr gastroenterol nutr 64(1):133–153
11. Chirica M, Resche-Rigon M, Pariente B, Fieux F, Sabatier F, Loiseaux F et al (2015) Computed tomography evaluation of high-grade esophageal necrosis after corrosive ingestion to avoid unnecessary esophagectomy. Surg Endosc 29(6):1452–1461
12. Chirica M, Resche-Rigon M, Zagdanski AM, Bruzzi M, Bouda D, Roland E et al (2016) Computed tomography evaluation of esophagogastric necrosis after caustic ingestion. Ann Surg 264(1):107–113
13. Bruzzi M, Chirica M, Resche-Rigon M, Corte H, Voron T, Sarfati E et al (2019) Emergency computed tomography predicts caustic esophageal stricture formation. Ann Surg 270(1):109–114
14. Chirica M, Kelly MD, Siboni S, Aiolfi A, Riva CG, Asti E et al (2019) Esophageal emergencies: WSES guidelines. World J Emerg Surg 14(1):26
15. Ehrmann S, Quartin A, Hobbs BP, Robert-Edan V, Cely C, Bell C et al (2017) Contrast-associated acute kidney injury in the critically ill: systematic review and Bayesian meta-analysis. Intensive Care Med 43(6):785–794
16. Benjamin B, Agueb R, Vuarnesson H, Tranchart H, Bongrand NM, Sarfati E et al (2016) Tracheobronchial necrosis after caustic ingestion. Ann Surg 263(4):808–813